1   WHAT IS CLAIMED IS:

5

        1.   An MR (MagnetoResistance effect) head
comprising:
        a slider; and
        a film structure part which is located on an
10   air outflow side of the slider and includes an MR
element for reproducing,
        the film structure part having an end
surface located on an identical side as a floating
surface of the slider,
15   the end surface of the film structure part
and the floating surface of the slider forming a step-
like recess which has a depth making it possible to
prevent a fine projection on a magnetic disk from
hitting the end surface of the film structure part.

20

        2.   The MR head as claimed in claim 1,
25   wherein the depth of the step-like recess causes an
end of the MR element on the end surface of the film
structure part to be located on or above an imaginary
line which passes through a rear edge of the slider
and said end of the MR head when the MR head is in a
30   floating state at a given angle.

35   3.   The MR head as claimed in claim 1,
wherein:
        the depth of the step-like recess has a

1   length equal to or greater than a sum of a first
length and a second length;

the first length causes an end of the MR
element on the end surface of the film structure part
5   to be located on an imaginary line which passes
through a read edge of the slider that is in a
floating state at a given angle and which is parallel
to the magnetic disk; and

the second length corresponds to a magnitude
10   of a swelling of the end surface of the film structure
part, said swelling being formed when the film
structure part is thermally deformed.

15

4.   The MR head as claimed in claim 1,
wherein:

the depth of the step-like recess has a
20   length equal to or greater than a sum of a first
length and a second length;

the first length causes an end of the MR
element on the end surface of the film structure part
to be located on an imaginary line which passes
25   through a read edge of the slider that is in a
floating state at a given angle and which is parallel
to the magnetic disk; and

the second length corresponds to a
descending movement of the MR head after the MR head
30   is pushed upwardly by the fine projection, said
descending movement including an overshooting
movement.

35

5.   The MR head as claimed in claim 1,

1   wherein:

the depth of the step-like recess has a
length equal to or greater than a sum of a first
length, a second length, and a third length;

5   the first length causes an end of the MR
element on the end surface of the film structure part
to be located on an imaginary line which passes
through a read edge of the slider that is in a
floating state at a given angle and which is parallel

10   to the magnetic disk;

the second length corresponds to a magnitude
of a swelling of the end surface of the film structure
part, said swelling being formed when the film
structure part is thermally deformed; and

15   the third length corresponds to a descending
movement of the MR head after the MR head is pushed
upwardly by the fine projection, said descending
movement including an overshooting movement.

20

6.   The MR head as claimed in claim 1,
wherein the depth of the step-like recess satisfies

25   the following condition:

Y1 ≥ t1 x tanα

where Y1 is the depth of the step-like recess, t1 is a

30   distance between an air outflow end of the slider and
the MR element, and α is the floating angle.

35

7.   The MR head as claimed in claim 1,
wherein the depth of the step-like recess satisfies

1   the following condition:

$$Y3 \geq (t1 \times \tan\alpha) + Nh$$

5   where Y3 is the depth of the step-like recess, t1 is a
distance between an air outflow end of the slider and
the MR element, α is the floating angle, and Nh is a
magnitude of a swelling of the end surface of the film
structure part, said swelling being formed when the

10   film structure part is thermally deformed.

15   8.   The MR head as claimed in claim 1,
wherein the depth of the step-like recess satisfies
the following condition:

$$Y4 \geq (t1 \times \tan\alpha) + Z$$

20

where Y4 is the depth of the step-like recess, t1 is a
distance between an air outflow end of the slider and
the MR element, α is the floating angle, and Z is a
descending movement of the MR head after the MR head

25   is pushed upwardly by the fine projection, said
descending movement including an overshooting
movement.

30

        9.   The MR head as claimed in claim 1,
wherein the depth of the step-like recess satisfies
the following condition:

35

$$Y5 \geq (t1 \times \tan\alpha) + Nh + Z$$

1   where Y5 is the depth of the step-like recess, t1 is a
distance between an air outflow end of the slider and
the MR element, α is the floating angle, Nh is a
magnitude of a swelling of the end surface of the film
5   structure part, said swelling being formed when the
film structure part is thermally deformed, and Z is a
descending movement of the MR head after the MR head
is pushed upwardly by the fine projection, said
descending movement including an overshooting
10   movement.
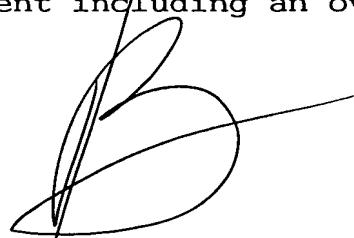
15   10. An MR (MagnetoResistance effect) head
comprising:
        a slider; and
        a film structure part which is located on an
air outflow side of the slider and includes an MR
20   element for reproducing,
        the film structure part having an end
surface located on an identical side as a floating
surface of the slider,
        the end surface of the film structure part
25   and the floating surface of the slider forming a step-
like recess which has a depth making it possible to
prevent a fine projection on a magnetic disk from
hitting the end surface of the film structure part,
and causes a first rear edge of the film structure
30   part to be located on or above an imaginary line which
passes through the first rear edge of the film
structure part and a second rear edge of the slider
when the MR head is in a floating state at a given
angle.

35

11. The MR head as claimed in claim 10, wherein the depth of the step-like recess satisfies the following condition:

$$Y2 \geq t2 \times \tan\alpha$$

where Y2 is the depth of the step-like recess, t2 is a thickness of the film structure part, and α is the floating angle.

12. The MR head as claimed in claim 10, wherein the depth of the step-like recess satisfies the following condition:

$$Y3' \geq (t2 \times \tan\alpha) + Nh$$

where Y3' is the depth of the step-like recess, t2 is a thickness of the film structure part, α is the floating angle, and Nh is a magnitude of a swelling of the end surface of the film structure part, said swelling being formed when the film structure part is thermally deformed.

13. The MR head as claimed in claim 10, wherein the depth of the step-like recess satisfies the following condition:

$$Y4' \geq (t2 \times \tan\alpha) + Z$$

where Y4' is the depth of the step-like recess, t2 is a thickness of the film structure part, α is the

floating angle, and Z is a descending movement of the
MR head after the MR head is pushed upwardly by the
fine projection, said descending movement including an
overshooting movement.

14. The MR head as claimed in claim 10,
wherein the depth of the step-like recess satisfies
the following condition:

$$Y5' \geq (t2 \times \tan\alpha) + Nh + Z$$

where Y5' is the depth of the step-like recess, t2 is
a thickness of the film structure part, α is the
floating angle, Nh is a magnitude of a swelling of the
end surface of the film structure part, said swelling
being formed when the film structure part is thermally
deformed, and Z is a descending movement of the MR
head after the MR head is pushed upwardly by the fine
projection, said descending movement including an
overshooting movement.

15. A magnetic disk apparatus comprising:
a magnetic disk;
an MR (MagnetoResistance effect) head; and
a supporting member which movably supports
the MR head above the magnetic disk,
said MR head comprising:
a slider; and
a film structure part which is located on an
air outflow side of the slider and includes an MR
element for reproducing,

1   the film structure part having an end surface located on an identical side as a floating surface of the slider,

        the end surface of the film structure part

5   and the floating surface of the slider forming a step-like recess which has a depth making it possible to prevent a fine projection on a magnetic disk from hitting the end surface of the film structure part.

10

        16. The magnetic disk apparatus as claimed in claim 15, wherein:

15   the supporting member comprises a suspension to which the MR head is fixed, and patterned wiring lines formed on the suspension; and

        ball members which are made of an electrically conductive material and connect terminals

20   of the MR head and the patterned wiring lines.

25   17. A magnetic disk apparatus comprising:

        a magnetic disk;

        an MR (MagnetoResistance effect) head; and

        a supporting member which movably supports the MR head above the magnetic disk,

30   said MR head comprising:

        a slider; and

        a film structure part which is located on an air outflow side of the slider and includes an MR element for reproducing,

35   the film structure part having an end surface located on an identical side as a floating surface of the slider,

1   the end surface of the film structure part
and the floating surface of the slider forming a step-
like recess which has a depth making it possible to
prevent a fine projection on a magnetic disk from

5   hitting the end surface of the film structure part,
and causes a first rear edge of the film structure
part to be located on or above an imaginary line which
passes through the first rear edge of the film
structure part and a second rear edge of the slider

10   when the MR head is in a floating state at a given
angle.

15

         18. The magnetic disk apparatus as claimed
in claim 17, wherein:
         the supporting member comprises a suspension
to which the MR head is fixed, and patterned wiring

20   lines formed on the suspension; and
         ball members which are made of an
electrically conductive material and connect terminals
of the MR head and the patterned wiring lines.

25   *ADD B5*

30

35